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In the Abstract:

Please replace the Abstract with the following amended Abstract:

--To provide comprehensive (i.e., rapid and sensitive) MS-MS analysis, the inventor employs a time-nested separation, using two time-of-flight (TOF) mass spectrometers. Parent ions are separated in a slow and long TOF1, operating at low ion energy (1 to 100eV), and fragment ions are mass analyzed in a fast and short TOF2, operating at much higher keV energy. A low energy fragmentation cell between TOF1 and TOF2 is tailored to accelerate fragmentation and dampening steps, mostly by shortening the cell and employing higher gas pressure. Since separation in TOF1 takes milliseconds and mass analysis in ~~TOF2-TOF2~~ microseconds, the invention provides comprehensive MS-MS analysis of multiple precursor ions per single ion pulse. Slow separation in TOF1 becomes possible with an introduction of novel TOF1 analyzers. The TOF-TOF could be implemented using a static TOF1, here described on the examples of spiratron, planar and cylindrical multi-pass separators with griddles spatial focusing ion mirrors. Higher performance is expected with the use of novel hybrid TOF1 analyzers, combining radio frequency (RF) and quadratic DC fields. An RF field retains low-energy ions within a TOF1 analyzer, while a quadratic DC field improves resolution by ~~compensate compensating for a large relative energy spread.~~ The invention provides an exceptional speed and sensitivity of MS/MS analysis, compatible with the time scale of chromatographic separation, thus, a real time LC-MS-MS and LC-LC-MS-MS analysis ~~are-is~~ possible without any prior limitations, such as a "data dependent acquisition" algorithm, currently employed in ion traps and Q-TOF.